

## **REMARKS/ARGUMENTS**

Reconsideration and withdrawal of the rejections of the application are respectfully requested in view of the amendments and remarks herewith, which place the application into condition for allowance.

### **I. STATUS OF THE CLAIMS AND FORMAL MATTERS**

Claims 21-31, 33-42, 45-48, and 50 are pending in this application. Claim 21 is hereby amended. Dependent claim 45 has been identified as being allowable if re-written in independent format. No new matter has been introduced. Support for this amendment can be found throughout the Application as originally filed.

Changes to claims are not made for the purpose of patentability within the meaning of 35 U.S.C. §101, §102, §103, or §112. Rather, these changes are made simply for clarification and to round out the scope of protection to which Applicants are entitled.

### **II. THE REJECTIONS UNDER 35 U.S.C. § 103(a) HAVE BEEN OVERCOME**

Claims 21, 22, and 28 were rejected under 35 U.S.C. §103(b) over U.S. Patent Publication No. 2003/0145894 to Burns (“*Burns*”) in view of Japanese Patent No. 2002277478 to Takehiko (“*Takehiko*”). Claims 31 and 33-35 were rejected under 35 U.S.C. §103(a) over *Burns* in view of U.S. Patent No. 5,957,579 to Kopf-Sill et al. (“*Kopf-Sill*”), and further in view of U.S. Patent No. 5,376,252 to Ekstrom et al. (“*Ekstrom*”) and U.S. Patent No. 3,537,889 to Mets et al. (“*Mets*”). Claim 36 was rejected under 35 U.S.C. §103(a) over *Burns* in view of *Kopf-Sill*, *Mets*, and *Ekstrom*, and further in view *Takehiko*. Claims 40, 41, and 47 were rejected under 35 U.S.C. §103(a) over *Burns* in view of *Kopf-Sill*, *Ekstrom*, and *Mets*. Claim 42 was

rejected under 35 U.S.C. §103(a) over *Burns* in view of *Kopf-Sill*, and further in view of *Ekstrom*, *Mets*, and U.S. Patent No. 6,509,085 to Kennedy (“*Kennedy*”). Claim 46 was rejected under 35 U.S.C. §103(a) over *Burns* in view of *Kopf-Sill*, *Ekstrom*, and *Mets*, and further in view U.S. Patent Publication No. 2002/0040754 to Tomita et al. (“*Tomita*”). Claim 50 was rejected under 35 U.S.C. §103(a) over *Burns* in view of *Kopf-Sill*, *Ekstrom*, and *Mets*, and further in view of Takehiko.

Applicants traverse and respectfully request reconsideration and withdrawal of the rejections for at least the following reasons:

**Claims 21, 22, and 28**

Claim 21, as amended, recites:

“A device comprising first and second inlet passages for respective immiscible fluids, the first and second inlet passages merging into a third passage, wherein, in use, **the two fluids flow along the third passage in intimate contact with each other under parallel laminar flow conditions, the third passage being formed with a constriction or other discontinuity**, in use, causing the two fluids to form into a flow of alternate segments.” (Emphasis added)

Indeed, neither *Burns* nor *Takehiko*, taken either alone or in combination, disclose or suggest “**two fluids flow[ing] along the third passage in intimate contact with each other under parallel laminar flow conditions [,]**” as recited in claim 21.

Amended claim 21 makes it clear that the two fluids flow under parallel laminar flow conditions in the third passage, as opposed to any other passage. Thus, *Burns* fails to teach that, in use, two fluids flow in intimate contact with each other under parallel laminar flow conditions in the third passage.

*Burns* also fails to teach or suggest the presence of “a constriction or other discontinuity,” much less a “**constriction or other discontinuity**” which causes the “two fluids” flowing “under parallel laminar flow conditions ... to form into a flow of alternate segments.”

Particularly, according to *Burns*, as described and illustrated in FIG. 9, the output capillary tube (11) connected to distribution device (1) is **not** formed with **any “constriction or other discontinuity[.]”** Secondly, regarding distribution device (1), according to *page 3, paragraph [0035]*, and FIG. 1 of *Burns*, a syringe driver (not shown) is used to inject dyed kerosene along capillary tube (9) and into capillary pathway (2), and water along capillary tube 10 and into capillary pathway (3). A series of slugs (16, 17) (see FIGS. 4-7 and 8) are then formed in capillary pathway (4) and capillary tube (11). The dyed kerosene injected along capillary tube (9) and into capillary pathway (2), and the water injected along capillary tube (10) and into capillary pathway (3), do not disclose or suggest **“two fluids flow[ing] along the third passage in intimate contact with each other under parallel laminar flow conditions [,]”** as recited in amended claim 21.

Furthermore, there is no teaching, suggestion or motivation in *Burns* directing the skilled person to the subject matter of claim 21.

*Takehiko* is concerned with the control of chemical reactions, as opposed to the controlled formation of segments, which is at least one object of the present invention. As with *Burns*, there is no teaching, suggestion or motivation in *Takehiko* that would direct a skilled artisan to arrive at the subject matter of claim 21, as amended. Furthermore, as with *Burns*, *Takehiko* also fails to disclose or suggest a **“constriction or other discontinuity”** which causes two parallel flowing fluids to form **“a flow of alternate segments of the two fluids.”** In fact, *Takehiko* does not disclose or contemplate any **“constriction or other discontinuity”** in the micro channel region (30). Rather, the Y-shaped inlet arms (20A, 20B) appear to merely merge along the micro channel (30).

For at least the foregoing reasons, Applicants respectfully submit that independent claim 21 is patentable over the relied upon portions of both *Burns* and *Takehiko*, taken either alone or in combination, and is therefore allowable. Dependent claims 22 and 28 are allowable at least on the basis that they depend from independent claim 21, which is allowable for the reason discussed above.

**Claims 31 and 33-36**

Claim 31 recites:

“A method of producing a segmented flow of first and second immiscible fluids comprising:

(i) **providing a device with a first conduit provided with a constriction or other discontinuity**

(ii) causing the first and second immiscible fluids to flow under laminar flow conditions along said first conduit, wherein the constriction or other discontinuity causes **the first and second immiscible fluids to form into a flow of alternate segments downstream of the constriction or other discontinuity**, wherein the device is provided with first and second inlet passages for the delivery of the first and second immiscible fluids respectively to the first conduit and wherein the device comprises two substrates disposed face-to-face, the surface of at least one of the substrates being profiled such that the first and second inlet passages are defined between the two substrates, wherein the substrates are encased within two or more casement layers, the substrates being disposed within a cavity formed by the casement layers.” (Emphasis added)

As described above, the *Burns* distribution device (1) is merely an independent device that connects to capillary tubes (9), (10), and (11). Neither the output capillary tube (11) nor the capillary pathway (4) form a “**conduit provided with a constriction or other discontinuity**” that “causes the ... fluids to form into a flow of alternate segments downstream of the constriction or other discontinuity.” Likewise, as illustrated in Fig.1 of *Burns*, in addition to capillary tube (9) and capillary pathway (2), capillary tube (10) and capillary pathway (3) also fail to include a “**conduit provided with a constriction or other discontinuity**,” whereby the “constriction or other discontinuity causes the ... fluids to form into a flow of alternate

**segments downstream of the constriction or other discontinuity.”** Further, nothing in the *Kopf-Sill, Ekstrom, and Mets* references appear to cure the described deficiency in *Burns* as applied to independent claim 31.

For at least the foregoing reasons, Applicants respectfully submit that independent claim 31 is patentable over the relied upon portions of both *Burns, Kopf-Sill, Ekstrom, or Mets*, taken either alone or in combination, and is therefore allowable. Dependent claims 33-36 are allowable at least on the basis that they depend from independent claim 31, which is allowable for the reason discussed above.

**Claims 40-42, 46 and 47**

Claim 40 recites, *inter alia*:

A fluid manipulation device comprising first and second ducts ... wherein said **first and second ducts join to form a third duct along which, in use, the first and second fluids flow under laminar flow conditions, the third duct being formed with a constriction, the constriction causing, in use, the first and second fluids to form into a flow of alternate segments,** ...wherein the device comprises two substrates ..., the substrates being encased within two or more casement layers, and the substrates being disposed within a cavity formed by the casement layers (Emphasis added)

For similar reasons described above with regards to independent claim 31, neither *Burns* nor *Kopf-Sill, Ekstrom, or Mets*, taken either alone or in combination, disclose or render predictable “**first and second ducts**” that “**join to form a third duct along which, in use, the first and second fluids flow under laminar flow conditions, the third duct being formed with a constriction, the constriction causing, in use, the first and second fluids to form into a flow of alternate segments [,]**” as recited in claim 40.

Accordingly, Applicants respectfully submit that claim 40 is in condition for allowance and urge reconsideration and withdrawal of this rejection thereto. Dependent claims 41-42 and

46-47 are allowable at least on the basis that they depend from independent claim 40, which is allowable for the reason discussed above.

### **Claim 50**

Claim 50 recites:

“A fluid manipulation device comprising **first and second ducts** . . . wherein said **first and second ducts join to form a third duct along which, in use, the first and second fluids flow under laminar flow conditions, the third duct being formed with a constriction, the constriction causing, in use, the first and second fluids to form into a flow of alternate segments**, wherein the device comprises two substrates disposed face-to-face, the surface of at least one of the substrates being profiled such that the first, second and third ducts are defined between the two substrates, the surfaces of the third duct that, in use, comes into contact with one or both of the first or second fluid comprising a fluoropolymer; immediately upstream of the third duct, the first and second duct extend parallel with each other. (Emphasis added)

For similar reasons described above with regards to independent claims 21, 31 and 40, neither *Burns* nor *Kopf-Sill, Ekstrom, Mets, or Takehiko*, taken alone or in combination, disclose or render predictable “**first and second ducts**” that “**join to form a third duct along which, in use, the first and second fluids flow under laminar flow conditions, the third duct being formed with a constriction, the constriction causing, in use, the first and second fluids to form into a flow of alternate segments** [,]” as recited in claim 50.

Accordingly, Applicants respectfully submit that claim 50 is in condition for allowance and urge reconsideration and withdrawal of this rejection thereto.

### **III. DEPENDENT CLAIMS**

The other claims in this application are each dependent from one of the independent claims discussed above and are therefore believed patentable for at least the same reasons. Since each dependent claim is also deemed to define an additional aspect of the invention, however,

the individual reconsideration of the patentability of each on its own merits is respectfully requested.

**CONCLUSION**

In view of the foregoing amendments and remarks, all of the claims in this application are patentable and Applicants respectfully request early passage to issue of the present application.

In the event the Examiner disagrees with any of statements appearing above with respect to the disclosures in the cited reference, it is respectfully requested that the Examiner specifically indicate those portions of the reference providing the basis for a contrary view.

The Commissioner is authorized to charge any additional fees that may be required to Deposit Account No. 50-0320.

Respectfully submitted,  
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